

CLAIMS

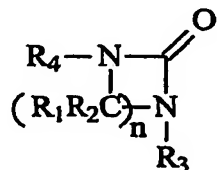
1. A process in two steps for the preparation of 1-octene starting from butadiene which comprises:

\*\* a first step (a) in which the bis-hydrodimerization of butadiene to 1,7-octadiene is effected in the presence of a catalyst based on a palladium complex containing one or more tri-substituted monodentate phosphines, in an aprotic polar solvent optionally containing an organic base; the above first step being carried out in the presence of a hydrogen donor;

\*\* a second step (b) in which the partial catalytic hydrogenation of 1,7-octadiene, recovered at the end of the first step, to 1-octene, is effected; the above hydrogenation being carried out in an inert solvent, under hydrogen pressure or mixtures of hydrogen and nitrogen, in the presence of a catalyst;

the above process being characterized in that:

(i) in the first step the aprotic polar solvent is selected from disubstituted cyclic ureas having general formula (I)



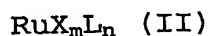
wherein n ranges from 1 to 8;

R<sub>1</sub> and R<sub>2</sub>, the same or different, are selected from H and a

C<sub>1</sub>-C<sub>6</sub> alkyl radical;

R<sub>3</sub> and R<sub>4</sub>, the same or different, are selected from C<sub>1</sub>-C<sub>16</sub> alkyl radicals;

(ii) in the second step the catalyst is selected from non-  
5 supported ruthenium complexes having general formula (II):



wherein:

X is selected from Cl, Br, I, CH<sub>3</sub>COO, H, =C(H)Ph;

L is selected from monodentate or bidentate neutral  
10 ligands;

m ranges from 1 to 3;

n ranges from 2 to 4.

2. The process according to claim 1, wherein in the compound having general formula (I), n is between 2 and 3;

15 R<sub>1</sub>=R<sub>2</sub>=H; R<sub>3</sub>=R<sub>4</sub>=CH<sub>3</sub>.

3. The process according to claim 1, wherein the palladium complex in step (a) is a preformed complex having the general formula PdX<sub>2</sub>(PR<sub>3</sub>)<sub>2</sub> wherein X = Cl, Br, acetate, and R<sub>3</sub> is a C<sub>1</sub>-C<sub>16</sub> hydrocarbyl radical.

20 4. The process according to claim 1, wherein the organic base used in step 1 is triethyl amine.

5. The process according to claim 1, wherein the butadiene is used in an initial weight ratio with respect to the solvent ranging from 1:10 to 10:1.

25 6. The process according to claim 5, wherein the butadi-

ene is used in a weight ratio with respect to the solvent ranging from 1:5 to 5:1.

7. The process according to claim 1, wherein the hydrogen donor is in a stoichiometric ratio of 1:2 molar with respect to the butadiene.

8. The process according to claim 1, wherein the hydrogen donor is formic acid.

9. The process according to claim 1, wherein the molar ratio between the organic base and hydrogen donor ranges from 0 to 1.5, more preferably from 0.2 to 1.3 and even more preferably from 0.4 to 0.8.

10. The process according to claim 1, wherein step (a) is carried out at temperatures ranging from 50 to 120°C, preferably from 70 to 100°C.

11. The process according to claim 1, wherein in the complex  $RuX_mL_n$ , m ranges from 2 to 3; n ranges from 2 to 4; X is selected from Cl and =CHPh; L is a phosphine.

12. The process according to claim 11, wherein X = Cl, m = 2, n = 4, L =  $PPh_3$ .

13. The process according to claim 11, wherein m = 3 n = 2 L =  $PCy_3$ .

14. The process according to claim 1, wherein the ruthenium complex in step (b) is present in the reaction mixture in a molar ratio with respect to 1,7-octadiene, ranging from 1/100 to 1/500,000, preferably from 1/1,000 to

1/150,000, more preferably from 1/5,000 to 1/50,000.

15. The process according to claim 1, wherein 1,7-octadiene is contained in the solvent in a ratio ranging from 5 to 90% by weight, more preferably from 10 to 80% by weight.

16. The process according to claim 1, wherein step (b) is carried out at a temperature ranging from 0°C to 150°C, preferably from 5°C to 60°C.

17. The process according to claim 1, wherein step (b) is carried out in the presence of mixtures of hydrogen and nitrogen, preferably in the presence of hydrogen alone, at a pressure ranging from 0.05 to 10 MPa, preferably from 0.1 to 3 MPa.

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